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# Book review

Armand M. de Callataÿ, *Natural and Artificial Intelligence: Misconceptions about Brains and Neural Networks.* North-Holland, Amsterdam, 1992. 156 + 560 pp., 165 Figs.

*Natural and Artificial Intelligence* (NAI) is a large book, presenting bold ideas about 'large-scale' brain architecture. Its structure is as follows: a Prologue and a long Introduction, each of about 100 pages. The third section consists of five chapters (300 pages in all) that develop a model of the brain in some detail. Finally there is a section of lengthy appendices and a glossary (another 100 pages). The Prologue and final section are an addition to the 1986 edition of NAI. The Introduction and five main chapters have been left unchanged since 1986. The prologue has not just been added to update the book. It is essentially a list of 'misconceptions' all of which "have prevented researchers from developing a fully fledged model of the brain". The appendices contain brief descriptions and discussions of recent models, such as neural networks and Minsky's Society of Mind.

NAI introduces new ideas to brain modelling and attempts to integrate a great many others. Its scope is enormous, nothing less than the modelling of the entire nervous system. Inevitably some ideas are developed more convincingly and in more depth than others. Particularly detailed treatment is given to the hierarchies of control, robotics, the possibility of using neural networks to generate symbolic behaviour, and the functions of the basal ganglia (to "adaptively learn how to choose a rewarding intention"). This work is ambitious and impressive. More tenuous is the claim, central to the model, that neural changes can be irreversible and all-or-none. De Callatay admits that the evidence for this claim is thin, and relies very heavily on very few papers on dendritic spine resorption.

Unfortunately NAI is written in an exhausting style which makes it very heavy going: it is littered with grammatical and spelling mistakes; it is badly structured, in that the Prologue constantly refers to ideas developed in the main body of the text and is exceedingly difficult to understand without having read the entire book first. The Prologue, in particular, is written in a style so dogmatic that one is constantly asking for corroborating evidence and arguments, and often not finding them. There are literally hundreds of sentences in the Prologue that start with "It is a misconception to think that ...", with misconception printed in bold, followed by some statement which the author


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holds to be true and which he sees as a particular impediment to progress in brain modelling. Misconception is a very provocative term to use in any scientific writing. It should be backed by great expertise and evidence thereof in the form of relevant references and convincing arguments. One might imagine a professor replying to a really silly question by a student that there must be 'a profound misconception'. But to fill 100 pages of a scientific book with misconceptions cannot be interpreted but as a form of gross overstatement. Having said this, the reader may often find himself agreeing with the 'misconceptions'. Our criticisms are not so much concerned with the contents of the Prologue as with the form in which the ideas are presented and their cursory justification. Both the Prologue and the rest of the book present many interesting ideas and models, but these often lack the support of up-to-date references or simulation studies that is needed to be fully convincing.

In summary, then, NAI is a goldmine for ideas, but they are difficult to dig up and not presented with enough coherence or evidence to evaluate their worth. This makes it difficult to judge its target audience. There is something in the book for psychologists, cognitive scientists, and neuroscientists, but it does not seem to be targetting any particular group. It is a book by a generalist written for generalists. The author would do his readers a big favor by reducing the book into perhaps two more focussed and more clearly structured volumes. In its present form only a fraction of the book's potential is realized. In comparison with Minsky's 'Society of Mind', for example, NAI is as provocative and profound in content but it falls far short in terms of presentation and attractiveness.

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